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FRIDAY, JULY 3, 1885.

COMMENT AND CRITICISM.

IT MAY NOW BE SAID to be the fashion for individuals of great wealth to make bequests to found new institutions of learning, or in general to help on such institutions already in existence, and in particular to endow specific departments of research. But it is much more than a fashion. We may presume that those making such bequests desire, in large majority, that the greatest good shall come from their gifts — if not in the advancement of knowledge, then in its diffusion among men. To be sure, we have many princely donations nowadays, which, while they provide for the worthiest of objects, are paraded in the public prints as if ephemeral notoriety were all the donor thought of. But this sort of bequest is growing increasingly less, and the ultimate substantial good is coming to be regarded uppermost.

It is indicative of a solid growth in our country, that an increasing proportion of its wealth is turned into the channels of education and science. What it took European nations hundreds of years to find out, the shrewdest of our public benefactors are fully aware of, — that no earthly institutions are so stable and enduring as the great colleges and universities; that solid endowments in these institutions have a lease of life which not even nations themselves can be sure of; and that funds thus deposited preserve their integrity when other forms of investment undergo complete dissipation. The chief institutions of higher education in America have an excellent record to exhibit in the management of the funds intrusted to their guardianship. They are not thought of ordinarily as at all different from other institutions and corporations which exist solely for self-remunerative interest. No college or university exists to make money. The income of such institutions is very largely derived from funds which have been given to them; and while fees are received, and make up a part of the income, they expend all they receive, as a rule, and only hope to receive more that they may give more. So, also, it is with all departments and organizations for scientific research.

'The more one has, the more one receives,' seems to be exemplified in the finances of our greatest university, the observatory of which has just received a bequest of nearly three hundred thousand dollars from the will of the late Mr. Robert Treat Paine of Brookline, Mass. The observatory receives one-half of this amount at once, — a sum large enough to enable the early resumption of the important researches which, through lack of funds, it became necessary to discontinue at the close of last year, — the remainder on the death of his widow. Mr. Paine died recently, at the advanced age of eighty-one years. Although not a professional astronomer, he was well known to all the astronomers of the present generation. His immediate contemporaries in the science have all, we believe, passed away. Mr. Paine took special interest in the prediction and observation of solar and lunar eclipses; and the persistency with which he followed these phenomena, even in late years, makes it probable that he had observed more eclipses than any other person. Also he made meteorological observations of great value; and his record of barometric and thermometric readings at a

single spot in Boston is said to be continuous for more than fifty years.

While Mr. Paine's bequest is at present chiefly noteworthy as enabling one important institution, temporarily embarrassed, to proceed with its work, and is thus most timely, it is also worthy of remark that it ranks high among specific bequests by scientific men themselves. That they rarely make large bequests, we presume to be no fault of their own, as but few of them ever come into the possession of great wealth, and fewer still are able to accumulate much more than enough to provide respectable support for their families. That Mr. Paine has done much more than this, is evident from the magnitude of his bequest; and it is gratifying to see so deserving an institution as the observatory of Harvard college come into the possession of an endowment copious enough to insure not only the continuance of its remarkable activity during recent years, but a considerable growth into new lines of research.

THE FIAT HAS GONE FORTH that in several of our cities the various telegraph, telephone, and electric-light wires must go underground within a very few months, and in New York a commission is shortly to be appointed to see that the legislative enactments are carried out. There are probably few competent persons, who have carefully and dispassionately considered the subject, who are not satisfied that an attempt to hurry this matter, and subject the wires to a premature burial, is, to say the least, extremely unwise. That it is scientifically practicable to work telegraph and telephone wires for short lengths underground, is unquestionable; but few persons who have not investigated the subject realize the great practical difficulties involved, and the very large expense required to insure satisfactory results. With the high-tension currents used in arc-lighting, additional difficulties are encountered that have not yet been satisfactorily surmounted. That the rapid increase of overhead wires is productive of much annoyance and danger, is evident to all; and even those most averse to legislation feel that most of the wires must eventually be placed underground. But in this, as in all matters which are still in an experimental stage, the only safe maxim is to hasten very slowly.

A RECENT PUBLICATION of the Society for the promotion of agricultural science — the second made by the society — contains the papers read at the Minneapolis meeting in 1883, and the Philadelphia meeting in 1884, together with a lecture by Dr. J. H. Gilbert on agricultural investigations, and lists of members of the society and of American experiment-stations. Thirteen papers were presented, — seven in 1883, and six in 1884. Some of these are of scientific interest, while it is difficult to see how others serve to advance agricultural science. The object of the society is a most praiseworthy one; but we doubt whether at present enough really scientific work is done in this country in the field of agriculture to render such a society necessary as a means of publication, however useful it may be as a means of bringing together for consultation and discussion those interested in agricultural science.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

Velocity and sediment.

MR. B. M. HARROD, in his note in *Science* of June 13, says that observations do not confirm the suggestions of Mr. Login as to an intimate relation between velocity and sediment. While stating negations, he might well have added, Neither does observation support the speculative dogmas laid down as fundamental truths by the Mississippi-River commission in its reports; for the Login notion pervades those reports, it having been adopted by Capt. Eads, and Capt. Eads's views having been adopted by the commission.

Mr. Harrod now amplifies a statement of Capt. Brown that the controlling influence of the Missouri over silt movement in the Mississippi is felt at the passes thirteen hundred miles below. As an interpretation of observations, the statement and its amplification are questionable.

Proceeding in his effort to throw the Login-Eads notion overboard, Mr. Harrod cites facts concerning erosion below Cairo to show that the more heavily silt-laden water on the west side of the river is also more active as an agent of erosion than the clearer water on the east side. Would not a muddy subject be clearer, if the idea of erosion as the cause of

silt-laden condition had been suggested, rather than an argument based on the implied converse? The fact is evident, that the water on the west side is more heavily laden because erosion on that side is most active. This, of course, directs the search for the cause of erosion in another direction than the one which those who would fain persuade themselves and others that the improvement of the Mississippi is possible by the principles and methods now employed, would choose to take.

The variations of silt-burden at the mouth of the Mississippi, attributed to the influence of Missouri-River water and the erosions below Cairo, have their final explanation in dynamic conditions which may be local.

The quantity of material delivered by the Missouri into the Mississippi may be nearly equivalent to the quantity discharged by the Mississippi into the Gulf for any period without establishing a presumption of identity; since that quantity is small, compared with the total moved, as the result of erosions of bank and scour in bed, in the thirteen hundred miles between the entrance of the Missouri and the Gulf. No direct evidence has yet been obtained that any particle of sand has ever traversed the thirteen hundred miles without one or many rests; but there is much evidence that transportation of sediment is by intermittent steps, times of rest being far in excess of motion. That the quantity in motion varies enormously in a few miles' distance was shown by the Fulton observations of 1879 and 1880, and the variation in quantity was clearly accounted for by observed local erosions and deposits.

Erosions and the consequent silt movement are due to an excess of energy in the stream (energy is a function of mass and fall or slope) beyond that necessary to overcome bed-resistances, mostly friction. The excess must be expended where it occurs; and the work done in the way of destructive action on bed and bank, and in the transportation of eroded material, measures the excess. The amount of surplus energy varies with time and place; so, also, the work done.

To trace any instance of work to its cause is not possible or necessary. Apprehension of the fact that erosion and silt-transport, with the consequences, — a shifting channel and uncertain elevation of surface for a given volume, — are due to dynamic conditions dependent upon volume of water and its absolute height above sea-level, on the one hand, and the character of channel, its length, form, and material, on the other, will be a safeguard against many errors of interpretation, of which Mr. Harrod's note affords two examples. ROBERT E. MCMATH.

St. Louis, June 17.

Korean curios.

I enclose an extract from a letter from Lieut. G. C. Foulke, U. S. navy, of the U. S. legation at Seoul, Korea, in which he kindly gives more exact information in reference to my article in *Science*, vol. iv. p. 172, and also in regard to Prof. E. S. Morse's criticism on said article in *Science*, vol. iv. p. 270.

GEORGE F. KUNZ.

Min Yong Ik is a blood nephew of the Queen of Korea. His father gave him for adoption to Min Thai Ho, who was killed in the conspiracy of December, 1884. He is stated by orientals generally to be *by affinity* a *prince*, and so generally titled. The present king and queen have one child, a son, — the crown prince: by Korean rule, Min Yong Ik ranks next to him.

Min Yong Ik's thumb-ring is a *thumb-ring:* it is not in the least like an archery thumb-guard, which I never saw an *officer* have or use on any occasion, nor do they have or use such. Min's jade thumb-ring is one of a class of articles, among which are short strings of shell-beads, pieces of amber, etc., very commonly owned by Korean officers, as many persons use canes at home to occupy the hands to play with.

The gold ornament Min wore was a button indicating his rank: it was (as it must be) attached by a black silk cord to a hair frontal band.

I have heard from many people that at Kurngang San, on the east coast of Korea, were columns of stone more than six times the height of a man. Some said they were crystals; but others (and one eye-witness) do not speak of them as such. Probably the columns below the water in the sea presented that appearance. Most people say there were tree-like shaped stones. Kurngang San is the place spoken of by Prince Min to Mr. Kunz.

Professor Morse is quite correct in saying the social customs of the country would interfere with Min's bringing his wife to America. Min often said he intended to bring her, etc.; but his talk was perfect nonsense, for he never meant it.

An indian paint-cup.

While searching for Indian remains on an island in the Susquehanna, I found a paint-cup which is somewhat different from the ordinary. In place of a water-worn pebble which has had a natural hollow on one side, — and which is, I believe, the material invariably used, especially in the east, — this is made from a fragment of sandstone, which has been hollowed out entirely by artificial means. Some of the powdered oxide of iron still remains in the cup, and, if moistened, answers very well for a coloring-matter. The site where I found the cup has furnished quite a number of relics, and was very probably the rendezvous of fishing-parties. HARVEY B. BASHORE.

West Fairview, Penn.

Premature appearance of the periodical cicada.

The communication of Prof. Lester F. Ward on this subject in *Science* (v. 476) will no doubt surprise other members of the Biological society of Washington as much as it did the undersigned.

Memory of a sound after the lapse of many years is untrustworthy, as a rule; and I was unwilling to accept as an established fact the statement of such an abnormal occurrence, which Professor Ward based solely on such memory. Yet I nevertheless endeavored to give reason for its possibility, there being a vast difference between a possibility and an established fact. Professor Ward then effectually weakened his testimony by evidence of faulty memory as to the season when Cicada septendecim was heard by him when a boy.

His evidence was rejected by me for that reason, and for the further reason, that, upon his own ground of rejecting inexpert testimony in memory of a visual impression as to hybrid oaks, we must reject his inexpert testimony in memory of an auditory impression as to Cicadas. I nowhere pronounced his Virginia observations 'wholly worthless,' nor the occurrence 'impossible as contrary to all canons of entomology.'

Professor Ward, in his private conversation with me, made no attempt to describe the notes of October last, but simply affirmed his recollection of them as similar to those of C. septendecim. His description in *Science* is of one of the notes of the species, and he seems to be ignorant of the fact that Cicada septen-

decim has several very distinct and variable notes. He has probably been misled by the abnormal condition of things the present year in the District of Columbia, where the English sparrow has so prevented the full maturity of the males, and so decimated their ranks, that the more characteristic noises, and those most apt to be recollected, have scarcely been heard. This has been a common remark among entomologists, who recollected former visitations in other parts of the country.

Finally, Professor Ward will convince no one that I was ever guilty of speaking of the note of Cicada pruinosa as 'precisely like' that of C. septendecim, though the mature and louder note of the latter much more nearly resembles that of the former than he seems to imagine. C. V. Riley.

Washington, D.C., June 17.

Periodical cicada in Massachusetts.

Among the localities given by the earlier writers for the present septendecim brood of the periodical cicada, are Fall River and the south-eastern portion of Massachusetts. These need confirmation; as, so far, no reports have been received from Massachusetts the present year. There is a brood which appears at Fall River one year later. I shall be glad to get confirmation either of the absence or presence of the insect the present year from the readers of *Science* in south-eastern Massachusetts. C. V. Riley.

Washington, D.C.

Height of land in Connecticut.

The ninth and last edition of the 'Encyclopaedia Britannica' has the statement that there is no land in Connecticut 'above a thousand feet in elevation.' Statements equivalent to this will be found also in 'Appletons' American cyclopaedia' and in 'Johnson's cyclopaedia.' A survey by an engineer, Mr. G. M. Bradford, in 1873, which was based on the survey of the Connecticut western railroad, gives the heights of several points in the north-western part of this state, and these results cannot be much in error. I am indebted to Mr. Henry Norton of Goshen, Conn., for the communication of these heights. It will be remembered that Salisbury is the north-western town of the state, and that east of it, joining Massachusetts, are Canaan and Norfolk: Goshen joins Norfolk on the south. The following are some of the heights above sea-level: —

	Feet.
Ivy Mount (Goshen)	1,642
Haystack Mount (Norfolk)	1,672
Bald Mount (Norfolk)	1,770
Bradford Mount (Canaan)	1,910
Bear Mount (Salisbury)	2,100
Brace Mount (Salisbury)	2,300

It may be thought hardly worth while to dispute any statement made in a cyclopaedia; but, having been born and reared among the beautiful hills of Connecticut, I dislike to see them diminished to one-half their height, even by such a ponderous authority as the 'Encyclopaedia Britannica.'

Asaph Hall.

June 27.

The ginkgo-tree.

In *Science*, No. 124, Mr. L. F. Ward states that the Frankfort, Ky., ginkgo-trees are the only ones known to him in the United States that have borne fruit. Permit me to say that a group of these trees in Central Park, New-York City, have borne fruit to my knowledge for the past six years, and that in great abundance. R. P. Whitfield.

Amer. mus. nat. hist.,
June 24.

THE FORMATIVE FORCE OF ORGANISMS.

The assertion is safe, that the majority of biologists incline at present to explain the forming of an organism out of its germ upon mechanical principles. The prevalent conception is, that the forces of the ovum are so disposed that the evolution of the adult organism is the mechanical result of the predetermined interplay of those forces. The object of the present article is to point out that this conception is inadequate, and must be at least supplemented, if not replaced, by another view; namely, that the formative force is a generally diffused tendency, so that all parts inherently tend to complete, by their own growth and modification, the whole organism, — a fact which finds a legitimate hypothetical expression in Darwin's doctrine of pangenesis. The nature of the view here advanced will become clearer upon consideration of the evidence upon which it is based, and which is adduced below. The evidence that the formative force is diffused through all parts falls under three heads: 1. The process of regeneration in unicellular and multicellular bionts; 2. The phenomena of the duplication of parts; 3. All forms of organic reproduction. Let us briefly consider these categories.

1. *Regeneration.* All living organisms have to a greater or less degree the ability to repair injuries: indeed, we must regard the power of regeneration as coextensive with life, but the capacity varies enormously in the different species. In man the power is very small, though more extensive than is generally realized. Among annelids are species the individuals of which may be divided in two, and each piece can regenerate all that is needed to render it a complete worm. We sometimes see a small fragment of a plant, a single switch of a willow for instance, regenerate an entire tree, — roots, trunk, branches, leaves, flowers, and all. In the last instance a few cells possess a latent formative force, which we recognize by its effects, but cannot explain. We perceive, therefore, that each individual has, as it were, a scheme or plan of its organization to which it strives to conform. As long as it actually does so, the cells perform their routine functions; but when an injury destroys or removes some portion, then the remaining cells strive to conform again to the complete scheme, and to add the missing fragment. The act of regeneration of lost parts strikes the imagination almost as an intelligent pursuit by the tissues of an ideal purpose.

Our knowledge of the regenerating power

has recently received important extensions through the noteworthy experiments of Nussbaum [1] and of Gruber,[2] who have demonstrated independently the possibility of dividing unicellular animals so that each piece will regenerate the missing parts. In this manner the number of individuals can be artificially multiplied. For example: Nussbaum divided a well-isolated Oxytricha into two equal parts, either transversely or longitudinally, and found that the edges of the cut became soon surrounded with new cilia. Although some of the substance of the body, or even a nucleus, was lost through the operation, yet, by the following day, the two parts converted themselves into complete animals with four nuclei and nucleoli (*nebenkerne*) and the characteristic ciliary apparatus. "The head-piece has formed a new hind end; the right half, a new left half." The new-formed duplicate Infusoria multiplied subsequently by spontaneous division. From one Oxytricha cut in two, Nussbaum succeeded in raising ten normal animalcules, which subsequently all encysted. After an unequal division, the parts are both still capable of regeneration, but parts without a nucleus did not survive; which suggests that the formative energy is in some way bound up with the nucleus. But nucleate pieces may break down. Thus all attempts at artificial multiplication of the multinucleate Opalina failed, although the division of Actinosphaerium had been successfully made by Eichhorn as long ago as in the last century. Pelomyxa palustris has been successfully divided by Greef, and Myxastrum radians by Haeckel.

Gruber (*l. c.*, p. 718) describes his experiments with Stentor: "If one divides a Stentor transversely through the middle, and isolates the two parts, one finds on the cut surface of the hind part, after about twelve hours, a complete peristomial field with the large cilia and buccal spiral newly formed. On the other hand, the piece on which the old mouth is situated has elongated itself backwards, and attached itself in the manner peculiar to these Infusoria. If one has made a longitudinal section, so that the peristom is cut in two, then the peristoms both complete themselves, and the lateral wounds heal over. I have repeatedly separated by trans-section pieces considerably less than half of the original Stentor, and these have also regenerated themselves to complete animals." Gruber, too, observed that artificially divided Infusoria were capable of subsequent spontaneous multiplication. If the section is not very deep, there may arise double monsters; but here, just as in spontaneous divisions, as long as there remains an organic connecting-band, the two parts act as one individual, showing that the nervous actions are not restricted to determined paths. Gruber also adds, that two divided pieces may be reunited, if they are brought together again quickly enough. The observation thus briefly announced is of such extreme interest and importance, that the publication of the full details of the experiment will be eagerly awaited. Gruber adds, that at present we cannot go much beyond the proof of the existence, to a high degree, of the regenerative capacity in unicellular organisms. He also makes the significant observation, that, in the Protozoa, we have to do foremost with changes of function; in the Metazoa, with growth also.

2. *Duplication of parts.* In these anomalies we find an organ which, although an extra member, yet still conforms to the type of the species. For example: a frog is found with three posterior limbs; dissection proves the third leg to agree anatomically with the typical organization of the frog's hind leg. In determining the importance to be attributed to this evidence, it should be remembered, on the one hand, that these instances are by no means unusual; on the other, that the agreement with the normal structure is not uniform.

3. *Asexual reproduction.* When a species multiplies by fission of any kind, we must assume that each part, after division, possesses the formative tendency, since we see it build up what is necessary to complete the typical organization of the individual. Again: a bud of a hydroid or polyzoon, although comprising only a small part of the body, is equally endowed with this uncomprehended faculty. In pseudova we reach the extreme limit: in Aphis, for example, the parent gives off a single cell, the capacity of which to produce a perfect and complicated individual, fully equals the like capacity of a hydroid bud or of half a worm.

The evidence forces us to the conclusion that the formative force or cause is not merely the original disposition of the forces and substances of the ovum, but that *to each portion of the organism is given*, 1. *The pattern of the whole organism;* 2. *The partial or complete power to reproduce the pattern.* The italicised formula is, of course, a very crude scientific statement, but it is the best which has occurred to me.

[1] M. NUSSBAUM. *Ueber spontane und künstliche zelltheilung.* Sitzungsb. Niederrhein. ges. nat. u. heilkunde. Bonn, Dec. 15, 1884. [I regret very much that I know this paper only by Gruber's abstract.]

[2] A. GRUBER. *Ueber künstliche teilung bei Infusorien.* Biolog. centralbl., iv. (No. 23) 717–722.

The formative force, then, is a diffused tendency. The very vagueness of the expression serves to emphasize our ignorance concerning the real nature of the force. In this connection, I venture to insist upon the fact that we know little or nothing concerning any of the fundamental properties of life, because I think the lesson of our ignorance has not been learned by biologists. We encounter not infrequently the assertion that life is nothing but a series of physical phenomena; or, on the other hand, what is less fashionable science just now, that life is due to a special vital force. Such assertions are thoroughly unscientific; most of them are entirely, the remainder nearly worthless. Of what seem to me the prerequisites to be fulfilled before a general theory of life is advanced, I have written elsewhere.[1]

Charles S. Minot.

UNDERGROUND WIRES.

During the last few years the number of electric wires in all of our large cities has rapidly increased, especially since the introduction of the telephone and the electric light; and the probability is that the next few years will show a further large increase. If these wires run on poles, they not only disfigure the streets, but seriously interfere with the operations of firemen, as we have repeatedly seen during the last few years. A cobweb of wires supported on housetops requires the line-men to continually tramp through the houses and over the roofs, causing annoyance to the tenants, and damage to the buildings. Moreover, wires fixed to housetops are subject to removal at the whim of the owner, and they have to be continually removed from building to building as the good will of each owner is exhausted. Again: overhead wires, whether placed on poles or housetops, are continually coming in contact with each other, causing annoyance and danger; and an extra heavy rain or sleet storm so entangles and breaks them as to entirely interrupt communication. The annual cost of repairs of overhead wires in cities is not less than thirty per cent of the first cost of construction.

In almost all of the large cities the question is being asked, Why cannot these wires be gathered into cables and buried, along with the gas and water pipes, under the streets? In answer, it is proposed to review briefly the technical difficulties that arise, and to show how they may be and are overcome. It is proposed, further, to compare the cost of construction and maintenance of overhead wires with the cost of construction and maintenance of underground cables, and thus to see which is desirable from economical considerations.

There are two reasons, apart from the difficulty of securing good insulation, why underground lines are comparatively inefficient: —

1. If an electric conductor be brought near to a large mass of conducting-matter, as is a wire when it is taken down from a pole and buried in the earth, there appears in the current the phenomenon of retardation, by which each signal, instead of being sharp and distinct, is partly kept back, so that it overlaps and mingles with the next. The result is to limit the speed of working of the apparatus, or, if, like the telephone, it be an apparatus in which the currents are necessarily extremely frequent, to confuse and destroy the signals altogether.

2. The second difficulty is called induction, and is noticed when two or more wires are run side by side and near together, as they necessarily are in an underground cable. If the signals on one wire of such a cable be sharp and quick, they cause facsimile signals on all of the neighboring wires; and this, too, though the insulation may be absolutely perfect. The result of this phenomenon is, that messages sent over one wire are liable to be received on all of the other wires; and in telephony each person can easily overhear all that the others are saying.

Fortunately, however, both of these difficulties vary with the electrical qualities of the cable; and while I have seen cables of a thousand feet, over which it was difficult to talk, and in which the cross-talk was nearly as loud as the direct conversation, on the other hand, I have conversed easily over an underground cable extending from Paris to Orleans, eighty-five miles; and this, too, while other parties similarly separated were talking over other conductors of the same cable. There was absolute secrecy.

Last summer I visited France and Germany, and made, together with Mr. Berthon (chief engineer of the French telephone company), Mr. Cäel (chief engineer of the French government telegraph), and Herr Guillaume (constructor of the underground lines of the German empire), a series of telephone experiments on underground lines, varying from 5 to 100 miles in length, from 2.87 to 48 ohms resistance, and from 0.06 to 0.35 microfarads capacity per mile.

These experiments furnish us with ample

[1] C. S. Minot. *On the conditions to be fulfilled by a theory of life.* Proc. Amer. assoc. adv. sc., xxviii. 411.

data from which to deduce the requisites of any cable, in order that it may transmit speech, and without cross-talk from the neighboring conductors. These are briefly as follows: —

1. Good conductivity.

2. High insulation; for without this the current leaks from one conductor to the others, giving rise to cross-talk; and it is possible to talk by direct leakage between two conductors whose insulation is several million ohms.

3. Low specific inductive capacity; for, the greater the capacity, the greater the retardation, and the greater also the cross-talk due to induction.

Below is a table showing the specific inductive capacity and insulation of various insulators. The measurements were all made on a wire 0.05 of an inch in diameter, coated with insulation to a thickness of 0.10 of an inch.

Cable.	Maker.	Insulation per mile in meghoms.	Specific inductive capacity in microfarads.
Gutta-percha,	Siemens Bros., London.	190	4.2
India-rubber,	Rattier, Paris.	170	3.7
Renti . . .	A. G. Day, New York.	150	4.0
Faraday . .	Faraday cable-works, Cambridge, Mass.	15,000	1.6
Patterson . .	Western electric company, Chicago.	450	3.1
Brooks . .	David Brooks, Philadelphia.	-	2.8

Let us take a special case, and compare a gutta-percha cable having a specific inductive capacity of 4.2 with a Faraday cable of 1.6. The table predicts that we can talk three times as far with the latter as with the former, and experiment shows that we can. Again: the cross-talk on the gutta-percha cables ought to greatly exceed that on a Faraday cable; and experiment has shown, that, while conversation over a two-mile gutta-percha cable was continually disturbed by existing cross-talk, conversation was carried on over a similarly constructed Faraday cable five miles in length without the cross-talk being appreciable.

By proper attention to the electrical qualities, then, we may talk underground a much greater distance than we shall ever have reason to in any city system, and this without cross-talk from the neighboring circuits.

We have seen that telegraph and electric-lighting currents are not subject to the technical difficulties we have been discussing, and that, provided good conductivity and good insulation are assured, it is with them purely a question of expense. Let us, then, determine the relative expense of overhead and underground wires.

Suppose we have a large city with a telegraph-office near the centre, and that it is desired to carry a hundred wires to the city limits, say, three miles distant. Let us suppose that the wires for the first mile rest on housetops, and for the remainder of the distance on poles. The cost will be: —

35 roof-fixtures	@	$45	$1,575
80 poles, with arms, etc.	@	65	5,200
300 miles No. 9 wire	@	16	4,800
Stringing 300 miles wire	@	8	2,400
			$13,975

Underground, the cost would be: —

6 miles (50 conductors) No. 17 lead-covered cable	@	$3,000	$18,000
3 miles trenching, troughing, laying, and refilling	@	2,000	6,000
			$24,000

That is, the relative first cost of an overhead and an underground line, to do the same work, would be, say, $14,000 and $24,000.

The same conclusion will hold true for telephone-wires, provided we confine ourselves to the problem of running out from the central office, by fifty or a hundred conductor cables, to a large number of distributing-points so situated about the city that any subscriber would be easy of access, by a short overhead line, to one or another of them; and this is the problem that really occurs. So much for construction.

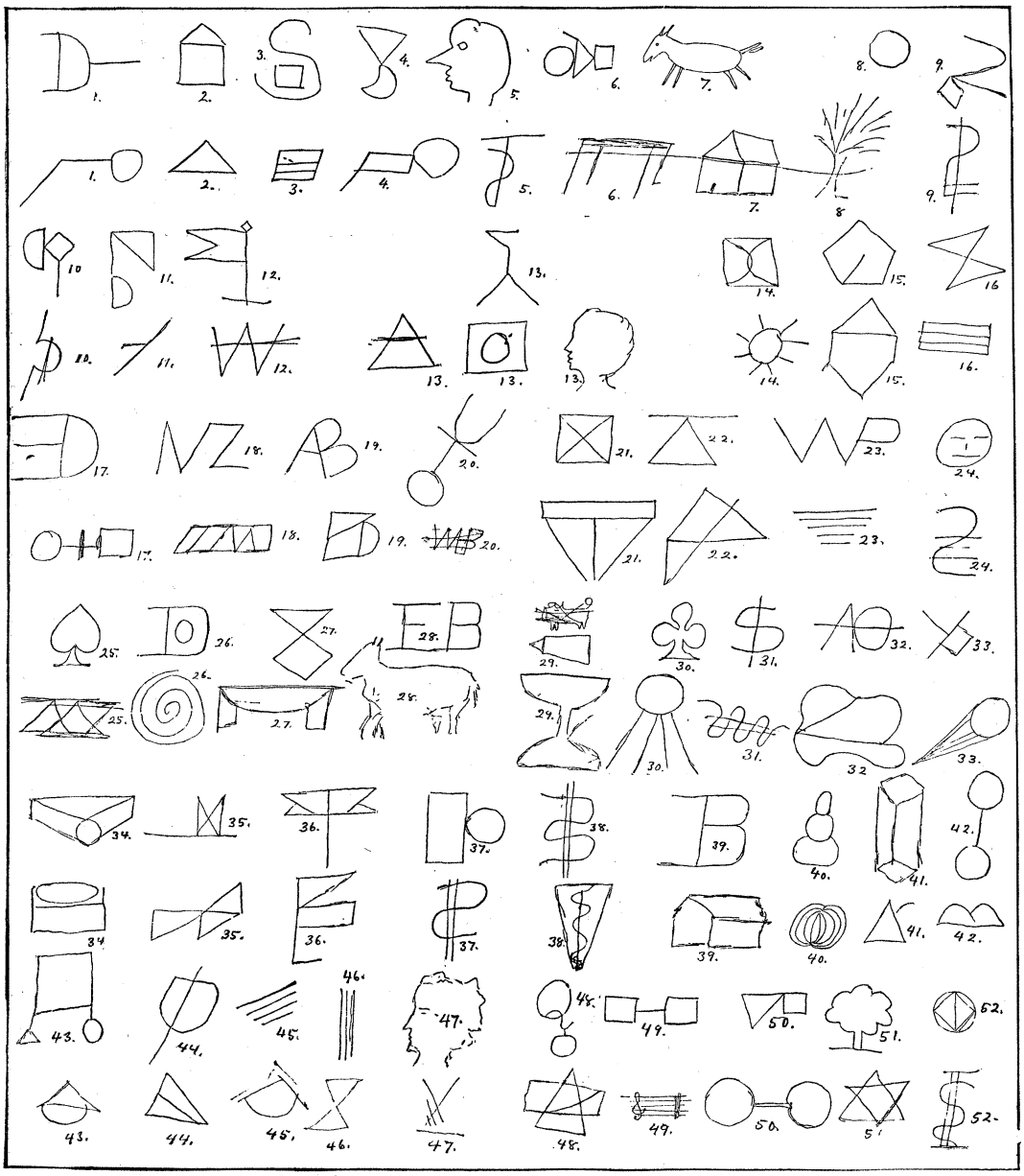
The yearly cost of repairing an overhead system, including roof-rentals, is not less than thirty per cent of the cost of construction; and the line would have to be renewed once in twelve years. The cost of repairing an underground system is practically *nil*. The Paris telephone company, with wires extending to three thousand subscribers, does not keep any repair-men. The durability of an underground system, provided lead-covered cables are used, and there is no internal cause of deterioration, is at least thirty years. Last summer we examined some lead-incased gutta-percha cables that had been in use by the French government for that length of time, and found them in perfectly good condition. The same is true of India-rubber cables incased in lead.

Herr Guillaume says of a cable in use by the German government, similar to the Faraday cable, "We are using it altogether in our new construction. I do not see how it can ever decay. We tried cotton-covered wires soaked in paraffine and drawn into lead pipes; and, though they worked well at first, after a few years they failed."

W. W. JACQUES, PH.D.,
Electrician of the American Bell telephone co.

THOUGHT-TRANSFERENCE IN BOSTON.

THE committee on thought-transference, of the American society for psychical research, issued a circular during the winter, describing some simple experiments in guessing digits or the color of cards to test the theory of Professor Charles Richet of Paris, that thought-transference might exist to some degree in all persons. A large number of returns were received from persons making the trials according to the directions of the circular, and the results will



REDUCED FACSIMILE OF DRAWINGS SHOWING SOME EVIDENCE OF SO-CALLED THOUGHT-TRANSFERENCE.

be published in the first number of the proceedings of the society, which will appear during the summer. Besides these set experiments, Mr. W. H. Pickering of Boston met with some success in the experiments which have attracted so much attention from the English society, — experiments in which a drawing thought of by one person, is reproduced by another, who has no visible means of obtaining information as to what the drawing may be. In the accompanying illustration we have reproduced all the figures as they were drawn, numbering them from 1 to 52. The upper line in each case contains the originals, and the lower the reproductions. The originals were made either by Mr. Pickering or by one of his friends, and the reproductions were most of them made by a young lady, who, on one or two evenings when the experiments were tried, met with some success. It may be well to state, that with figs. 6, 7, 8, and 20, certain extraneous causes acted which interfered with the results. The first forty figures were all made in one day; figs. 41 to 47 inclusive were made by another person; the remaining figures were made by the sensitive, so called, on a day when apparently there was no thought-transference.

MIMICRY AMONG MARINE MOLLUSCA.

IT is a curious fact, that, while among the terrestrial animals the number of known cases of protective mimicry is very large, among aquatic animals it is very small. I have no doubt that the comparative poverty of our knowledge of the habits and situation of aquatic animals in part accounts for this, but I believe also that there is really vastly less mimicking. I do not know of any marine species, that, harmless in themselves, mimic formidable species for protection; but there are instances in which forms are modified in color or shape so as to resemble the surroundings in which they live, and thus escape the observation of their enemies. In the summer of 1879, Dr. E. B. Wilson, while studying in Brooks's laboratory at Beaufort, N.C., found abundant specimens of Ovulum uniplicatum, — a mollusk living upon the stems of Leptogorgia virgulata (a sea-fan abundant there in shallow sounds). The stem of the sea-fan is of an orange-yellow color, and, further, is often marked with yellow swellings where the coral has spread itself over the shell of an attached barnacle. The Ovulum has a yellow shell; and the skin folds up over the shell, and is also of an orange-yellow color, — precisely the same color as that of the pennatulid, — so that the snail escapes notice very readily indeed. It is abundantly found upon the Leptogorgia, and never met with except associated with it.[1] Last summer at Beaufort, in trawling in ten fathoms of water, a few miles off Cape Lookout, we took a Leptogorgia whose general habit was the same as that of L. virgulata, but which was very different from it in color. In this one the color is deep rose, almost purple, and mottled with white at the openings, where the polyps are fixed. Now, the question was, Is there an Ovulum for this Leptogorgia? and on examination, sure enough, there was found a large number of the Ovulums, in this case again imitating the colors of the host. This Ovulum is undoubtedly of the same species as the yellow one, for it presents no difference except in color. The shell is red-brown; and the folds of skin that surround it in the expanded snail are deep-rose color, and *mottled with white spots*. Here, then, is another very good illustration of the familiar principle that forms will vary in adaptation to their surroundings, and of the part that mimicry may play in natural selection. Confined in aquaria, the snails sought their own corals to creep over them; and, if the red snail and yellow coral only were put into the same aquarium, the snail showed not the least desire to creep over the coral, but remained creeping about the walls of the aquarium.

I observed another snail last summer that I feel sure must owe its shape and color, at least in part, to mimicry, though here there were not so good grounds for the conviction as in the case just mentioned. I found on the beach at Fort Macon, one day after a strong southerly gale, a single specimen of an undetermined species of Scyllaea, — a nudibranch characterized by a pair of tentacle shields, and two pairs of elongate narrow processes of the skin upon the back, on the inner side of which white delicate gills are placed. This creature, when placed upon the Sargassum, or gulf-weed, shows the closest resemblance to it. The color is almost identical with that of the alga, a light brown. The body is elongate and much compressed, and the foot-sole an elongate, narrow groove, perfectly adapted for adhering to the alga stem. The tentacle sheaths and the skin processes upon the back are thin, and at the edges are wavy, and present the most perfect resemblance to the leaves (?) of the alga. The compressed body is further terminated posteriorly by a thin vertical portion like a fin,

[1] Dr. W. Breitenbach, in *Popular science monthly*, January, 1885, p. 365, mentions vaguely some nudibranch that imitates the sea anemones upon the stems of Sargassum.

which is also thin and wavy-margined. Placed upon a mass of Sargassum in an aquarium, the Scyllaea was hard to find, so closely did it imitate the appearance of the leaves. To make this an undoubted case, the Scyllaea should have been found upon the gulf-weed, and should never occur anywhere else.[1] This was found on the sand; and it is the only specimen that has ever been found by our party, so that we may consider it a rarity. As it can swim very readily, almost like a heteropod in this respect, and is naturally found only in the outside waters, the chances were against their being found in any numbers. It seems to me that there can be but little doubt that this creature presents another interesting case of mimicry, and deserves mention, and additional observation if any one is so situated as to be able to make it. Henry Leslie Osborn.

PROFESSOR HUXLEY ON DARWIN.

Our readers have been informed, that, through popular international subscription, a fund had been raised to erect a statue to Charles Darwin, and that this was recently unveiled with appropriate ceremonies at the new museum of natural history in South Kensington. We copy from *Nature* the address upon that occasion, made by Professor Huxley in the name of the committee, to the Prince of Wales as representative of the trustees of the British museum. We accompany it by a portrait and signature of Darwin, taken from a photograph obtained in London in 1872, and inscribed, "I like this photograph better than any other which has ever been taken of me. — Ch. Darwin."

"Your royal highness, — It is now three years since the announcement of the death of our famous countryman, Charles Darwin, gave rise to a manifestation of public feeling, not only in these realms, but throughout the civilized world, which, if I mistake not, is without precedent in the modest annals of scientific biography.

"The causes of this deep and wide outburst of emotion are not far to seek. We had lost one of those rare ministers and interpreters of nature whose names mark epochs in the advance of natural knowledge; for, whatever be the ultimate verdict of posterity upon this or that opinion which Mr. Darwin has propounded, whatever adumbrations or anticipations of his doctrines may be found in the writings of his predecessors, the broad fact remains, that since the publication, and by reason of the publication, of the 'Origin of species,' the fundamental conceptions and the aims of the students of living nature have been completely changed. From that work has sprung a great renewal, a true *instauratio magna* of the zoölogical and botanical sciences.

"But the impulse thus given to scientific thought rapidly spread beyond the ordinarily recognized limits of biology. Psychology, ethics, cosmology, were stirred to their foundations; and the 'Origin of species' proved itself to be the fixed point which the general doctrine of evolution needed in order to move the world. 'Darwinism,' in one form or another, sometimes strangely distorted and mutilated, became an every-day topic of men's speech, the object of an abundance both of vituperation and of praise more often than of serious study.

"It is curious, now, to remember how largely, at first, the objectors predominated; but, considering the usual fate of new views, it is still more curious to consider for how short a time the phase of vehement opposition lasted. Before twenty years had passed, not only had the importance of Mr. Darwin's work been fully recognized, but the world had discerned the simple, earnest, generous character of the man, that shone through every page of his writings.

"I imagine that reflections such as these swept through the minds alike of loving friends and of honorable antagonists when Mr. Darwin died, and that they were at one in the desire to honor the memory of the man, who, without fear and without reproach, had successfully fought the hardest intellectual battle of these days.

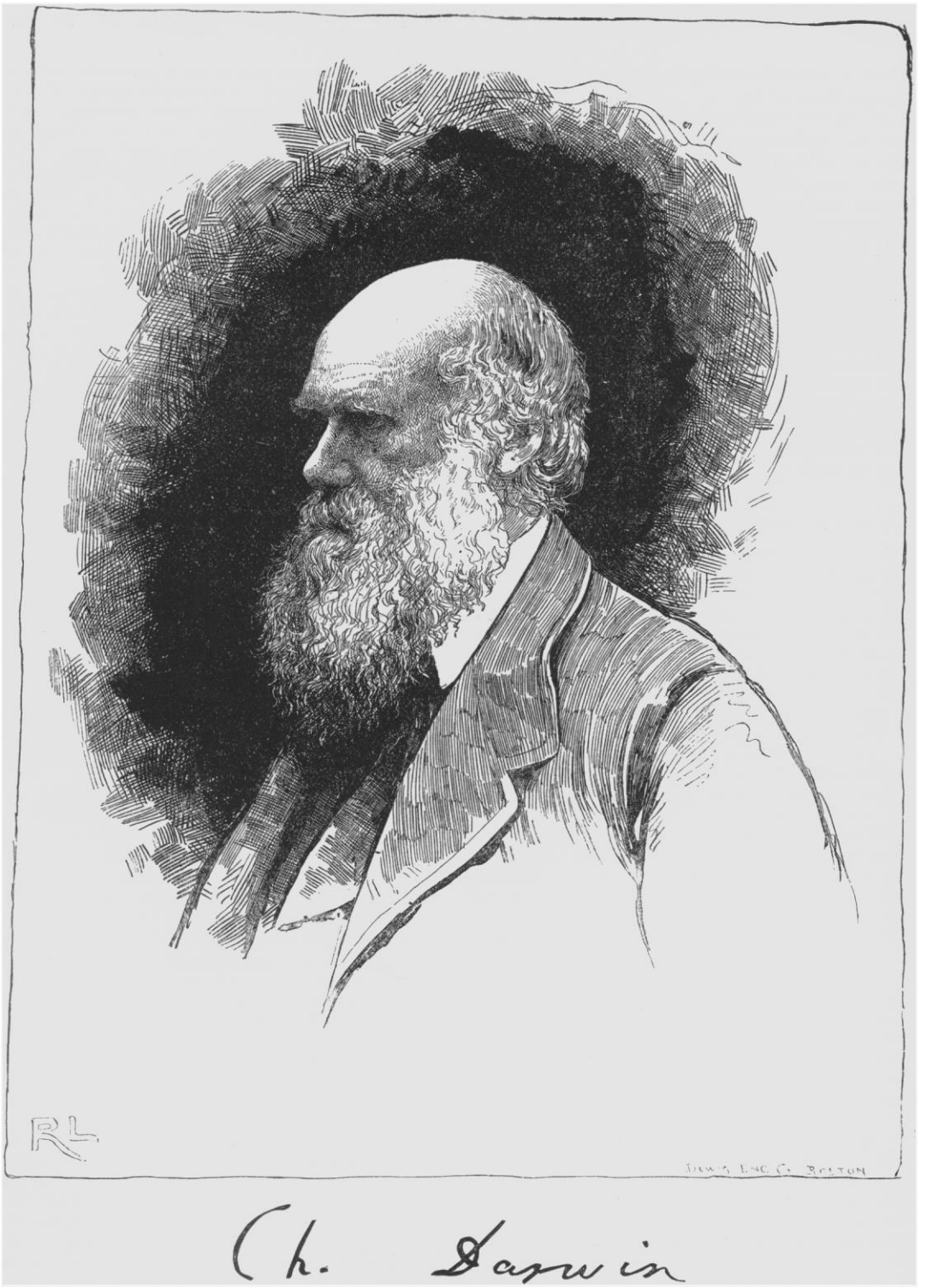
"It was in satisfaction of these just and generous impulses that our great naturalist's remains were deposited in Westminster Abbey; and that immediately afterwards, a public meeting, presided over by my lamented predecessor, Mr. Spottiswoode, was held in the rooms of the Royal society for the purpose of considering what further steps should be taken towards the same end.

"It was resolved to invite subscriptions, with the view of erecting a statue of Mr. Darwin in some suitable locality, and to devote any surplus to the advancement of the biological sciences. Contributions at once flowed in from Austria, Belgium, Brazil, Denmark, France, Germany, Holland, Italy, Norway, Portugal, Russia, Spain, Sweden, Switzerland, the United States, and the British Colonies, no less than from all parts of the three kingdoms; and they came from all classes of the community. To mention one interesting case, Sweden sent in 2,296 subscriptions 'from all sorts of people;' as the distinguished man of science who transmitted them wrote, 'from the bishop to the seamstress, and in sums from five pounds to twopence.'

"The executive committee has thus been enabled to carry out the objects proposed. A 'Darwin fund' has been created, which is to be held in trust by the Royal society, and is to be employed in the promotion of biological research. The execution of the statue was intrusted to Mr. Boehm; and I think that those who had the good fortune to know Mr. Darwin personally will admire the power of artistic divination which has enabled the sculptor to place before us so very characteristic a likeness of one whom he had not seen.

"It appeared to the committee, that, whether they

[1] Dr. Breitenbach, in the article above referred to, mentions without any names, and with too vague description for indentification, a creature on the Sargassum that would seem to be Scyllaea.



From a photograph inscribed,
"I LIKE THIS PHOTOGRAPH VERY MUCH BETTER THAN ANY OTHER WHICH HAS BEEN TAKEN OF ME."

regarded Mr. Darwin's career or the requirements of a work of art, no site could be so appropriate as this great hall; and they applied to the trustees of the British museum for permission to erect it in its present position. That permission was most cordially granted, and I am desired to tender the best thanks of the committee to the trustees for their willingness to accede to our wishes. I also beg leave to offer the expression of our gratitude to your royal highness for kindly consenting to represent the trustees to-day.

"It only remains for me, your royal highness, my lords and gentlemen, trustees of the British museum, in the name of the Darwin memorial committee, to request you to accept this statue of Charles Darwin. We do not make this request for the mere sake of perpetuating a memory; for, so long as men occupy themselves with the pursuit of truth, the name of Darwin runs no more risk of oblivion than does that of Copernicus or that of Harvey.

"Nor, most assuredly, do we ask you to preserve the statue in its cynosural position in this entrance-hall of our National museum of natural history as evidence that Mr. Darwin's views have received your official sanction; for science does not recognize such sanctions, and commits suicide when it adopts a creed.

"No: we beg you to cherish this memorial as a symbol by which, as generation after generation of students of nature enter yonder door, they shall be reminded of the ideal according to which they must shape their lives, if they would turn to the best account the opportunities offered by the great institution under your charge."

ROUTES INTO THE INTERIOR OF WESTERN CHINA.[1]

A GLANCE at the map shows in Yun-Nan and the adjacent part of Burmah the proximity of several large rivers, which separate farther south, and empty along the coast between the Yellow Sea and the Bay of Bengal. Evidently the solution of the problem of reaching western China is to be sought in the course of these rivers or on their banks. The first of these rivers to the east is the Yang-Tze-Kiang, which may be easily ascended for seven hundred kilometres. Junks can proceed above that as far as Sion-Choo, in Se-Chuen; but it is impossible to go higher, and consequently impossible to reach Yun-Nan. South of the Yang-Tze-Kiang is the Si-Kiang, or Canton River, navigable to the city Pe-se, nine hundred kilometres. Regular caravans then proceed by land to Yun-Nan, a route which is shorter than by the Yang-Tze-Kiang.

But Song-Ka, the river of Tonquin, offers a shorter route than this; and Lieut. Kergaradec says that steamers of light draught can reach Laos-Kai, on the Chinese frontier, while junks ascend to Mang-Hao, in the centre of the Yun-Nan territory.

We have nothing to hope from the Me-Kong. Its outlet is much farther away, and rapids are numerous. It is impossible at present to seriously think of building a railway on its banks a thousand kilometres in length, and, what is more, in an unknown, savage, and hostile country, and one of the most mountainous regions of the world. The Saluen empties into the Indian Ocean; but in most of its course it flows near the Me-Kong and Yang-Tze-Kiang, and traverses with them the province of Yun-Nan. Starting from Martaban, a stone road could proceed to the junction of the Main-Long-Gye, follow this river, traverse the mountain range which separates the basins of the Saluen and the Me-Nam, proceed to Zimme, then to Kiang-Hai, descend the He-Kok to the Me-Kong, and ascend this river to the frontier of China, and even as far as Talifu. This is a long and very hilly course; for it is necessary to pass from one basin into a second, then into a third, and, further, to build the route into the valley of the Me-Kong, — a plan any thing but practicable. It means gigantic labor and incalculable expense, without considering the probable hostility of the population.

[1] Condensed from *Science et nature*.

A railway already follows the lower course of the Irrawadi, between Rangoon and Prome. This route has just been extended to Tungu on the Sitang, and ultimately will proceed to Mandelay, and even to Bhamo. A branch could be made at Mandelay, and touch the Me-Kong at Kiang-Tung, though in this comparatively short space it must cross at least eight mountain chains having a height of two thousand metres. One can imagine the inclination of the sides and the depth of the valleys among mountains so near each other. The Saluen flows seven hundred metres below the hills which border it: it is therefore out of the question to consider this.

Another project is to start from Bhamo, and to reach Talifu by Man-Wyne or Momein. In this territory the hills are even more marked, more abrupt, and steeper, than in the preceding, and the population is much to be feared. Even the Brahmapootra has been suggested: it is easily ascended to Sooja, partly by rail, partly by steam; but above this the route is impracticable, there being a rapid and uninterrupted succession of high mountains and high-banked rivers.

To summarize these data, the two Chinese rivers must be abandoned, not precisely on account of the difficulties of the territory, but because for a long time the celestial empire will be more or less impenetrable and dangerous for Europeans, and the course of the Me-Kong is too long and too hilly. The routes which traverse the bed of the Brahmapootra and the valley of the Irrawadi present such obstacles that they are impracticable. The route of the Saluen is more attractive; but it must not be forgotten, that, besides its length, it must cross two watersheds, one of which at least is very difficult, and must ascend the Me-Kong for a very long distance. The route by the Red River remains, which is not at all wonderfully accessible; but, to establish communications with Yun-Nan and with Se-Chuen, some obstacles must be surmounted; and this is the course which offers fewest of them. Beside the fact that it is shortest, it will not be necessary to cross mountains or to traverse valleys. The French recently sent a commission of engineers to survey for a railway between Tonquin and Burmah. We doubt whether this project can be realized; but these investigations will necessarily bring forth important data in regard to the penetration of western China.

THE GEOLOGY OF JAPAN.

THE Japanese geological bureau has prepared a series of maps illustrative of the geology of the Japanese archipelago, to be presented at the Geological congress at Berlin this year. The bureau was established in 1879, and includes topographical, geological, and agronomical departments, and a chemical and technical laboratory officered by Germans. The area already surveyed by the topographers is about eighty geographical miles square; and the whole country is expected to be surveyed and mapped in about eight years more. The geological survey has reached about the same extent as the topographical. The maps and accompanying text are being published in both Japanese and English. The agronomical survey was begun in 1882. A map showing the knowledge at present attained, of the geological structure of Japan, is amongst the series. The observations made are summarized as follows: All the geological formations are met with in Japan. Gneiss occurs in small quantities in the neighborhood of Nagasaki and in the centre of the main island. Crystalline schists, consisting of mica, talc, marble, serpentine, etc., are found in Shikoku and the south-west of the main island. The paleozoic formations embrace the largest portion of the country, and are found everywhere. The mesozoic formation, including trias, jura, and chalk, is also known in Japan, but is not so prevalent as the previous one. Trias occurs in the north and south-west of the main island and in Shikoku. Chalk is found widely distributed in Yezo, the main island, and Shikoku. The cenozonic formation, including the tertiary and quaternary, is found everywhere on the edges of the older mountain ranges. In these formations numerous remains of mammals are found, especially of prehistoric elephants. Of the Plutonic rocks, granite is found widely distributed, and covers, next to the paleozoic formations, the widest area. The volcanic rocks consist mostly of trachyte and andesite: basalt is rare. Among the soils in Japan is the so-called tuff, i.e., volcanic tuff, which, for the most part, consists of decomposed silicates, and which is of great importance to agriculture. It is almost wholly unknown in Europe, while in Japan it forms the greater part of the so-called *kara*, which are the uncultivated plains at the foot of mountains, but which will bear cultivation. Accurate knowledge of this kind of soil will be of the utmost moment to Japanese agriculture. It is also noticeable that Japanese soils in general are very poor in chalk, and would therefore be improved by the addition of marl and chalk.

AMERICAN ENGINEERS AT DEER PARK.

THE annual convention of the American society of civil engineers, just held at Deer Park, Md., June 24–26, will be remembered as one at which more business was transacted, and more discussion elicited, than at any previous convention of the society. In fact, the limit in this direction may fairly be said to have been reached; and the thin attendance at the meetings of the last day was followed early in the afternoon by a motion, which was unanimously carried, that the reading of the remaining papers be dispensed with, as the members were too tired to listen to them. The experience at the conventions of the past few years had indicated the advisability of devoting less time than formerly to excursions and sight-seeing; and the meeting this year was therefore purposely held in a place offering little of local engineering interest, and where almost the whole time could be devoted to the business of the occasion.

The convention was attended by over one hundred

members; and the proceedings were opened on Tuesday, June 23, by the reading of a very interesting paper by Mr. E. B. Dorsey, entitled 'English and American railroads compared.' It appears that the average cost of the English railroads has been $202,-227 per mile, as against $62,176 for the American roads. At six per cent, to justify this increased expenditure, that part of the operating expenses which is affected by good or bad construction should involve a saving of about $8,000 per mile per year in the case of the English roads. The comparisons of the writer showed that this was by no means the case, the saving being rarely over $1,000. Comparisons of this kind, however, cannot pretend to be more than approximations, as the items of expense cannot always be accurately separated; and, moreover, the figured cost of English roads probably includes the cost of parliamentary proceedings in obtaining the charter. Regarding the physical characteristics of the English roads, few of them attain elevations of nine hundred feet above the sea; and their construction, therefore, offered few engineering difficulties, their greater first cost having been due to the almost entire absence of temporary structures. Recently several miles had been laid with steel sleepers, weighing a hundred and twenty-four pounds, on the London and north-western railway, following the example of the German roads, where they are quite common. Of freight-cars, only about twenty per cent have brakes in England; and these are so placed that they cannot be operated when the train is in motion: so the only effective ones are those on the engine and caboose. And in passenger-trains, where the air-brakes are used, but where only one car in three or four has a hand-brake, platform-cars heavily loaded with cast-iron, and provided with powerful hand-brakes, are attached on steep grades, to hold the train in case of accident to the air-brakes.

Prof. T. Egleston of New York presented an interesting paper on the cause and prevention of the decay of building-stones. In the speaker's investigation of the decomposition of calcareous materials due to the action of city gases and rain-water, he had found that the action was a maximum at a height of ten feet above the ground, above which point it decreased, and was null above a height of a hundred feet. To prevent decay, the only remedy was to make the stone water-proof. The speaker believed that a wash of sulphur was the only thing of value, where the stone was a dolomite, according to some experience in England. In the case of all porous stones, he considered that an effectual remedy would be to immerse the stone in boiled linseed-oil, renewing the application until the stone was saturated. Some discussion on this paper took place, many members believing that the use of oil would prevent the formation of a good bond between the stones and the mortar. It was stated, however, that the method had been tried with success in England.

A valuable and extensive report was presented by the committee on the preservation of timber, whose work has covered five years. It appears from the experience in this country that Kyannizing, or treatment with corrosive sublimate, though of value when the wood is only exposed to occasional moisture, is not efficacious when the wood is permanently wet. Although the testimony obtained was somewhat conflicting, the committee recommended the process of Burnettizing (chloride of zinc) as the best process for preserving railroad ties, principally on account of the low cost, which was only from twenty to twenty-five cents a tie. Creosoting was found too expensive; although it is the only effectual method for wood exposed to the attacks of the teredo and limnoria, and is, without doubt, the most generally successful process. In connection with this report, a report was presented by Mr. F. Collingwood, on the preservation of forests.

A paper followed by Mr. Jos. M. Wilson of Philadelphia, on specifications for iron and steel railroad-bridges, which was succeeded by a long discussion regarding the cantilever bridge at Niagara Falls, on which a paper had previously been presented to the society. The specifications for this bridge, in which steel was used for all the principal compression members, provided for the use of open-hearth steel alone. In this discussion the opinion was very generally expressed that Bessemer steel should not have been barred out, and that in drawing up specifications the engineer should insist simply on a certain quality as determined by physical tests, leaving the manufacturer free in the method of manufacture. It is probable in this case, however, that Bessemer steel was excluded to prevent delays in getting steel from works that had not had experience in making steel for structural purposes, as most of the Bessemer works had been making rail steel, and not structural steel. The fact that in making the steel for this bridge a hundred and thirty-six beats out of two hundred and forty-five were rejected, showed, in the opinion of many members, that engineers were requiring too much of steel, that the specifications were too rigid, and that a softer steel should have been used.

Among the remaining papers presented, brief mention may be made of a few. Mr. J. A. Ockerson described a new apparatus for printing conventional topographical signs upon maps by means of a roller. Mr. Clemens Herschel gave a new method of determining the discharge over a submerged weir. Capt. Michaelis read a paper entitled 'Can we make heavy guns?' Professor Egleston added his testimony that there would be no difficulty in making cast-steel guns of a hundred or even a hundred and fifty tons. Mr. C. B. Brush explained the method of aerating the water supplied to Hoboken. The bad taste and disagreeable odor previously existing had been entirely remedied.

In addition to the reading of papers, some important business was transacted at the convention. There having been considerable discussion of late in regard to the proper relation to each other of the form of the head of a rail, and the flange, and tread of wheels, it was resolved that a committee of five be appointed to investigate this subject. It was also resolved to memorialize congress to appropriate the sum of ten thousand dollars to carry on tests of steel

for structural purposes, under direction of this society, at the Watertown arsenal. The most important action, however, was the passage of a resolution providing for the appointment of a committee of seven, to consider what changes in the organization of this society might be advisable in connection with local engineering societies, and with sections or chapters of this society.

WORK OF THE CHALLENGER EXPEDITION. — I. GENERAL AND PHYSICAL.

Two immense quarto volumes luxuriously printed, and crowded with maps, plates, and woodcuts, form vol. i. of the series of Challenger reports, and the official introduction to that series when it shall be complete. This publication, unlike the monographs of which the series is composed, is the work of many hands, and has been editorially supervised by Staff-commander Tizard, R.N., Prof. H. N. Moseley, Mr. J. Y. Buchanan, and Mr. John Murray.

Owing to the recall of Capt. Nares for duty with the last British arctic expedition, the death of Sir Wyville Thomson, and other unforeseen occurrences, modifications of the original plan became necessary. The result is not altogether satisfactory to the editors, as they explain in the preface. It may be surmised that official red tape had something to do with the retention of a system, or rather want of system, which certainly might have been much improved; though, for that, the gentlemen named would appear not to be responsible. Thus, instead of finding the contributions of the expedition to any one branch of science summarized, or systematically and continuously indicated, the text abruptly changes, without apparent reason, from (let us say) hydrography to narrative, or to some abstract of new organic forms in a particular group, which seldom seems connected in any intimate way with the locality being described or with the subsequent text. Occasionally we get a section of transcendental theorizing on abstruse questions, of a sort which, however proper in its place, seems to us out of place in a volume intended for the general reader. The editors were also hampered by the fact that many of the special reports were incomplete, or not in a state to be briefly summarized. The inconveniences of the construction of the book will be sufficiently obvious to every reader; but, having said this, little more remains in the way of adverse comment. That the work is a mine of wealth for the hydrographer, the biologist, and the geographer, goes without saying. Even the ethnologist will find himself well rewarded for his study of its pages. The illustrations, though of unequal merit, are, for the most part, of a high degree of excellence; and some of the woodcuts, especially of corals, are extremely beautiful. Much of the success in this direction is doubtless due to the efforts of the artist of the expedition, Dr. J. J. Wild. There is a notable absence of the cheap 'process' cuts so conspicuous in most of our own government publications.

It is of course impossible, within the limits of *Science*, to adequately review a work of twelve hundred quarto pages, which in itself is a summary and a synopsis. We shall endeavor to touch upon a few of its more prominent features, premising that our references must necessarily be mere samples of the harvest gathered in its pages.

The voyage of the Challenger began, for deep-sea work, off the coast of Spain; thence, *via* the Canaries, across the Atlantic to the West Indies at St. Thomas; northward in a nearly direct line to Halifax, *via* Bermuda; southward along the coast to a point off the capes of Delaware to Bermuda, and again across the ocean to Madeira; southward again along the African coast nearly to the equator; westward to St. Paul Rocks and Cape Roque; south and south-east to latitude 40° south; eastward to Tristran da Cunha, the Cape of Good Hope, Marion, the Crozets, Kerguelen, and Heard Island; south to the antarctic ice; north-east to Melbourne and New Zealand; northward to Tongatabu; and westward through the Coral Sea and through the Philippine archipelago, and to Hong Kong. Thence they retraced their way, and, passing north from Papua to Anchorite Island, made a straight wake for Japan; and then eastward across the Pacific to the meridian of 156° west; southward to the Hawaiian Islands, Tahiti, and south latitude 40°; thence eastward to Juan Fernandez and Valparaiso; south, and through Magellan Straits, to the Falklands; and across the Atlantic to the 13th westerly meridian, near which they struck northward to the Cape Verdes, and so home. This course, it will be observed, gave, in the Atlantic, practically four transverse and two axial sections, a complete though rather irregular belt about the southern hemisphere, and an immense rectangle in the Pacific. The opportunities of such a navigation may be better imagined than described; and that they were not neglected, the magnifi-

Report on the scientific results of the voyage of H. M. S. Challenger [etc.]. *Narrative.* 1 vol. in two parts. London, *Government*, 1885. 4°.

cent work before us, with its companion volumes, is satisfactory testimony.

As is natural, the introductory chapters have something of an historical nature, apart from the narrative of the voyage itself; and the progress of deep-sea research is summarized, though without pretensions to monographic completeness. The remarkable results obtained by Sir John Ross, and his foreshadowing of many modern methods, are deservedly praised; and there is no doubt he was half a century beyond his contemporaries and many of his successors. The vessel, her fittings, and the methods of observation adopted, the instrumental devices provided for the regular work, and those suggested by experience, are described and figured in detail. It is known that the work of the Challenger was done with hempen lines, — the method in common use at the time she went to sea, — though wire was adopted shortly afterward. Bearing this in mind, it is easy to note a touch of official conservatism in the statement (p. 71), that "for purposes of deep-sea investigation, however, which includes actual sounding as only one of its items, good hemp sounding-line is still indispensable." The errors inevitable to the use of hemp, in all water not absolutely motionless from top to bottom, are sufficient to decide in favor of its rejection. These errors in the case of the Challenger sounding-work off the coast of the United States, where tested by the U. S. navy, are believed in some instances to reach more than two hundred fathoms, and are always liable to be as great when hemp is used. This is no reflection upon their work, which was unquestionably as good as their outfit permitted; but it forms an irrefragable argument against the use of rope, when a more accurate method is available.

Without attempting to go into detail for particular localities, it is worth while to trace the general physical features of the sea-bed, as developed by the Challenger work, and enlarged and confirmed by other expeditions, as represented by the charts accompanying this volume. These would have been still better, had the localities of supplementary information been indicated; for the hypothetical part, necessarily large, would thus have been much diminished for the casual inspector. It is pretty well determined, however, that the Atlantic is divided by submarine ridges into three different basins. These ridges, and the deeps they separate, are of singular conformation. From the southern part of Africa a ridge extends southwesterly to mid-ocean. From this a ridge extends a short distance westward, and another nearly due north to the equator. Sheering off from the African coast, with which it nevertheless preserves a curious parallelism, it extends north-westward, throwing off a spur toward French Guiana, which closes the northern rim of the south-western Atlantic basin. The central deep of this basin is supposed to lie about seven hundred miles off the mountainous coast-region of Brazil, from Cape Roque to the Rio Doce. From the last-mentioned portion of the ridge, it extends northward and eastward, widening as it goes, rising above the sea at the Azores, and finally joining the great arctic plateau, nearly in mid-ocean, at about the latitude of Paris. The north-western basin has its greatest deep north from, but close to, the Windward Islands. Here the coast-survey has since found the deepest water known in the North Atlantic. The eastern basin, of irregular and elongated form, has two deeps, — one westward from the Cape Verde Islands, the other north-eastward from St. Helena. There is a smaller depression just south from Cape Palmas.

In the southern ocean the antarctic plateau extends nearly to Africa, in latitude 40° south, and reaches New Zealand and Patagonia by narrow isthmuses. The vast area of the Pacific is less known and less markedly divided. Its greatest deep lies along the Kurile Islands, is very narrow, and is doubtless the deepest depression existing in any ocean. Apart from the Polynesian area, its most conspicuous elevation extends sickle-shaped from the coast of South America in latitude 40° south, to the meridian of 120° west. Otherwise the eastern portion of the Pacific presents an astonishing uniformity.

JAGNAUX'S TRAITÉ DE MINÉRALOGIE.

IT would not seem to be an unreasonable demand, that a volume of nine hundred pages, and bearing the date of 1885, should contain enough fresh and valuable matter to make its study thoroughly profitable to those specially interested in the subject of which it treats; but this will hardly be found to be true with this new Mineralogy of Jagnaux. The reader who expects to find the value of this large volume in proportion to its size will be much disappointed. The task which the author has set for himself — that is, the preparation of a work which shall give scientific descriptions of all important mineral species, and at the same time develop all the applications of

Traité de minéralogie appliquée aux arts, à l'industrie, au commerce et à l'agriculture, etc. Par RAOUL JAGNAUX. Paris, *Doin*, 1885. 883 p., 468 figs. 8°.

mineralogy to the various arts — is not an easy one. The two branches of the subject are too distinct to be easily fused together. The methods of crystallography and the process of making bricks are not very closely related. About one-half of the volume is devoted to the preliminary discussion of the general characters of minerals, physical and chemical, and to the description of species. This portion of the work is not only in no sense an original contribution, but it is not even a satisfactorily competent presentation of the present condition of the science. The author is evidently a faithful student of Haüy and Dufrénoy, but hardly seems to be aware of any thing that has been done, even in his own country, in the last twenty-five or thirty years. The chapters on crystallography and the optical characters of minerals, the classification and description of species, are all consistent in being what Dufrénoy would have given us in 1856. Even in minor points, modern innovations have been resisted: silica still appears in all the formulas as SiO_3, water as HO; and so on.

The portion of the work which is devoted to the practical side of the subject contains, however, much that is interesting and valuable, if not always original. In the preparation of it the author states that he has visited personally many manufactories and technical works, as well as consulted numerous standard books upon the subject. Some of the topics discussed in greatest detail are the coal industry, the manufacture of glass, of powder, of bricks, of porcelain, the treatment of various ores, and so on. The descriptions here are minute rather than profound, many trivial points receiving more attention than they deserve. The frequent long quotations from other authors, too, give the whole treatment rather a patchwork character. The reader looks in vain in this part of the work, as in the other, for evidence that the author is thoroughly acquainted with the progress that recent years have brought, especially outside of his own country. However, it must be allowed that a large amount of interesting matter has been brought together, particularly in regard to some of the leading French industries; and for this the book should have all the credit that it deserves. That the author had only a French audience in mind, is shown by the fact that the bibliography at the close of the volume contains (with the exception of two translations) only titles of French works; but while no fault need necessarily be found with this, we can but regret that he has not made more use of such admirable works as those of Des Cloizeaux and Mallard, which are mentioned in his list.

GEOLOGY OF THE VIRGINIAS.

IN publishing this compilation of Professor Rogers's contributions to the geology of the Virginias, Mrs. Rogers has conferred a substantial benefit upon the science; for Professor Rogers's investigations still remain the most important and the only systematic or comprehensive attempt to elucidate the geology of these great states, which are not excelled in structural complexity, or the interest of the problems which they present, by any district in eastern North America. But his reports were printed from forty to fifty years ago; and copies of them are now so extremely rare, that many geologists of the present generation have probably not seen them, and are not aware of the vast amount of careful and enduring work which they represent. Hence this reprint is in many respects as fresh and timely as the original publications, with the great advantage of combining in one convenient volume all of the annual reports and the widely scattered separate papers, and thus forming a handbook of Virginian geology which will be indispensable to the student of the Appalachian system, and constitute a necessary starting-point for all future investigations in the Old Dominion.

The geological survey of Virginia was instituted in 1835, and Professor Rogers's annual reports to the legislature for the first seven years make up the principal part of this volume. These reports were very properly designed for popular instruction, and are models of clearness and simplicity of style, without evident sacrifice of scientific accuracy and detail; while the general absence, in both terminology and theory, of indications that they were written nearly half a century ago, is a matter of constant surprise.

The difficulties attending geological explorations in Virginia were much greater at that time than now; but Professor Rogers's energy and industry had brought the survey of the largest area ever at that time subjected to systematic geological examination within one year of completion, according to his original plan, when it was abruptly terminated by the failure of the legislature to continue the appropriation. No provision was made for the final report, which was to embody in a digest-

A reprint of geological reports and other papers on the geology of the Virginias. By the late WILLIAM B. ROGERS, LL.D., etc. New York, *Appleton*, 1884.

ed form every important result attained in the progress of the survey, including the illustrative maps and sections. It is more pleasant than properly characterizing this short-sighted policy of the state, to call attention at this late day to the fact that this reprint of the annual reports is accompanied by a very satisfactory geological map of the Virginias, colored by Professor Rogers; by a generalized section from Chesapeake Bay to the Ohio River; and by ninety-six more local and detailed sections, traversing nearly every part of the two states, but especially the great valley and the neighboring mountain ranges. The sections are colored, and are exact reproductions of the originals drawn by the author. They are indicated on the map by lines numbered to correspond with the plates.

The arrangement of the book is chronological; and the annual reports are followed by several papers, published between 1840 and 1842, on the thermal springs of Virginia, illustrated by a plate of sections.

The often quoted paper on the physical structure of the Appalachian chain, by Profs. William B. and Henry D. Rogers, with three plates, dates from the same period, and must be regarded not only as an admirable summary of the characteristics of the Appalachian system, but also as an important chapter in the history of geological theories. This is followed by the evidence supporting Professor Rogers's view that the coal-bearing rocks of eastern Virginia are Jurassic, with a plate of coal-plants; and a discussion of the divisions of the tertiary, with five plates of eocene and miocene shells.

The volume concludes with an account of the infusorial deposit of Virginia, as exposed in the Fort Monroe artesian well, five hundred and fifty-eight feet below the surface. This was published in 1882, and, in the language of the editor, has a special interest, not only as the last published investigation made by Professor Rogers, but as being in the *same* field in which he began his labors half a century before.

The volume is provided with a good general index, and a full index of persons and places; and it is so conveniently compact, that the magnitude of the work is not realized until one attempts to read it.

NOTES AND NEWS.

THE statue in marble erected to the memory of Charles Darwin, executed by Mr. Boehm for the subscribers to the Darwin memorial, has been placed in the great hall of the new building at South Kensington containing the natural-history collections of the British museum. It is conspicuously placed at the head of the first flight of the great staircase, "as though," says the *Times*, "to welcome all coming generations of students as they enter the door of the building in which so many of the materials of their work are gathered together. So far as was possible, Mr. Boehm has rendered the very features and character of his subject; and all Mr. Darwin's friends agree, that a likeness more characteristic, whether in face or attitude, could hardly have been produced, even by a sculptor who had been intimately acquainted with him in his lifetime. The head is full of dignity: the great brow, the flowing beard, the expression, full at once of intense thought and of human feeling, have been caught and fixed in the marble." We have given elsewhere the address of Professor Huxley on the occasion.

— Among recent appointments at Harvard college, we note that of Winfield Scott Chaplin as professor of engineering; William Morris Davis, assistant professor of physical geography for five years; and Dr. Harold C. Ernst, demonstrator of bacteriology for 1885–86. The degree of LL.D. was conferred on Alexander Agassiz the naturalist, and Benjamin Apthorp Gould the astronomer.

— We learn from *Nature*, that on the receipt of communications concerning the proposed change in the time for beginning the astronomical day, as recommended by the recent International meridian conference at Washington, the lords of the committee of council on education requested the following committee to advise them as to what steps should be taken in the matter: Prof. J. C. Adams, the astronomer royal; Capt. Sir F. Evans, the hydrographer of the navy; Gen. Strachey; Dr. Hind; and Col. Donnelly. In accordance with their recommendations, copies of the report of the delegates to the conference at Washington, together with the resolutions adopted by that body, have been sent to various departments of the state, and to the following societies, etc.: Society of telegraphic engineers, Royal astronomical society, Royal society, Submarine telegraph company, Eastern telegraph company, Eastern and South-African telegraph company, Eastern extension, Australasia and China telegraph company, and the Railway clearing-house. They have been informed that these resolutions of the conference appear to my lords of the committee of council to be such as commend themselves for adoption; but, before informing the American government to that effect, their lordships would be glad to receive the opinion of the various societies on the subject.

— The last annual report of the Russian geographical society contains extracts from letters addressed by Prjevalski to the Grand Duke Alexander Alexandrovitch, which contains some further interesting details about his Hoang-ho journey. About the end of May he reached, as known, the foot of the Burkhan-budda Mountains, which enclose the high Thibet plateau separating it from Tsaidam.

Leaving there his baggage, he went with only thirteen men to the sources of the Yellow River. The climbing on the 15,700-feet-high passage of the Burkhan-budda ridge took three days. The descent, on the contrary, was very short, the plateau of Thibet being there 14,000 to 15,000 feet high. Further, 60 miles across the desert plateau brought the traveller to the sources of the Yellow River. They are 13,600 feet above the sea-level, and consist of two rivers coming from the south and west, and rising in the hills scattered on the plateau. A wide marshy valley, Odon-tala, 40 miles long and 20 miles wide, feeds numerous springs. The Hoang-ho itself is only a rivulet, dividing into two or three branches, each of them but 80 to 100 feet wide, and only 2 feet deep at low water. Some 13 miles below this place the Hoang-ho enters a broad lake, coloring its southern part with its muddy water; and, after leaving it on the east, it enters again another lake, whence it flows out as a large river; farther down it makes a great curve to avoid the snow-covered Amis-matchin range, and breaks through, in a wild course, the parallel ridges of the Xuen-lun. On the Thibet plateau the expedition experienced dreadful cold. In the second half of May, snow-storms were as strong as in winter, and the night frosts reached —23° C. Still the thin grass covering did not perish, and a few flowers re-appeared every day under the sun's rays. Even in June and July the thermometer fell, during bright nights, as low as —5°. As to rain, it poured every day, sometimes several days without interruption. The amount of vapor brought by the south-west monsoon, and deposited there, is so great, that during the summer northern Thibet becomes an immense marsh; needless to say, that the advance was difficult for camels. Though uninhabited by man, these deserts were full of herds of yakes, khoulans, antelopes, and mountain sheep. Even bears were seen in groups, sometimes of more than ten at once. Some thirty pairs were shot down. They are altogether very cowardly, and fly even when wounded. After having spent a few days at the source of the Hoang-ho, Prjevalski went south to the Blue River, called there Dy-tchou by the Tangoutes.

— Dr. Stephen Bowers, who is well known to archeologists from his extensive collecting in California, has recently described in the Ventura *Free press* an interesting discovery made by him in a dry cave in the San Martin Mountains, Los Angeles county. The cave was about twelve feet by sixteen. In it were nine baskets from six to twenty inches in diameter, made from tule, one of which contained fourteen pieces of red wood about a foot ong, notched, and painted with red and blue in streaks. Some of these sticks had as many as one hundred notches, and each stick was perforated at the ends. Another basket contained thirty-three head-dresses from four to five feet in length, made of feathers; another, forty-five whistles made from the tibiae of deer, the 'stop' being formed by inserting a mass of asphaltum, and the larger end of the bone covered with asphaltum in which is embedded a piece of haliotis shell. The most important objects found were four perforated stones mounted on handles of the hard wood of the bearberry, held fast in the holes by asphaltum. The discovery of these perforated stones, with short handles attached, is an important confirmation of F. W. Putnam's conclusions in relation to the probable use of the majority of similar stones, of which hundreds have been found in graves in southern California. The cave gave no evidence of having been used for any other purpose than as the place of deposit of these articles. Considerable basket-work was discovered in the *débris*, as also a haliotis shell-cup, a shell ornament, an implement made of deer's antler, and a smoothing-implement made of serpentine. No determination could be arrived at as to the length of time the articles had been in the cave; but, as it was perfectly dry, they may have been there for centuries.

— *Nature* gives the results of some recent experiments by Fol et Sarasin on the depth to which the light of the sun will penetrate into the sea. It will be remembered that in November last they recounted the results of their experiments on the same subject in the Lake of Geneva. The present paper describes similar experiments made in the Mediterranean off the zoölogical station and harbor of Villefranche. By means of photographic plates they have proved, that in the month of March, in the middle of a sunny day, the rays of the sun do not penetrate beyond four hundred metres below the surface of the Mediterranean. This is established by seven separate experiments, at varying depths, and different hours of the morning. At 380 metres, shortly before 11 A.M., the impression on the plate was less than that which would have been left on exposure to the air on a clear night without a moon. Between 1.20 and 1.30 P.M., at a depth of from 405 to 420 metres, there was no trace of any impression whatever on the plate. Light clouds do not appear to cause any notable diminution in the depth to which the light penetrates. In the Lake of Geneva the writers also undertook a new series of investigations to determine the effect of the season on the penetration of light. They give 200 metres as the extreme limit for winter in the lake; but they found that there is as much light at 380 metres in the Mediterranean as at 192 metres in the Lake of Geneva; and, by a comparison of these with previous experiments, it appears, the light penetrates from twenty to thirty metres deeper in March than in September: in the month of August, perhaps the difference is a little more. Compared with the series of plates exposed in the lake, those of the Mediterranean are characterized by a slower and more regular gradation. This gives rise to the idea, that while in the lake the light would be promptly intercepted by the deeper layers more or less disturbed or muddy, in the Mediterranean the absorption proper to pure water would be the principal, if not the sole, factor in arresting the luminous rays.

— One of the questions for discussion at the Sanitary congress at Rome was the measures to be adopted in regard to vessels from the east when they arrive in Mediterranean ports. Dr. Proust, the French

delegate, proposed "that vessels which had cases of cholera on board should be subjected to seven days' isolation, and that all the people on board should be divided off into groups, each of which should be released separately, if, after five days' observation, no case of cholera should have appeared among the persons composing such a group."

— The U. S. entomologist informs us that the destructive locust of California this year, as appears from larvae recently received, is Melanoplus devastator. Caloptenus differentialis has also been sent, but the former must be the chief source of injury.

— The Meteorological society of Vienna has resolved, says *Nature*, to erect a meteorological station on Mount Sonnenblick, near Tauern, in the central range of the Tyrolese Alps, thirty-one hundred metres above sea-level, and thus the highest station of the kind in Europe.

— The *Geological magazine* of London attains its majority the present summer; and as the present editor, Dr. Henry Woodward of the British museum, has been connected with it from the beginning, and during almost the whole time as its editor in chief, his friends are proposing to present him with a testimonial for the ability and fairness with which this successful magazine has been conducted. Friends of Dr. Woodward and of the magazine can forward any subscriptions to the treasurer, Mr. G. J. Hinde, 11 Glebe Villas, Mitcham, Surrey.

— One 'Prof. A. H. Lockwood,' *alias* 'Rev. J. H. Rockwell,' was arrested on June 17, at Garden Grove, Io., charged with using the U. S. mails for conducting fraudulent operations in the purchase and sale of scientific books. Any of our subscribers who have been defrauded will do well to communicate with D. H. Pulcifer, post-office inspector at Des Moines, Io.

— We learn from *Nature* that important experiments in aerial navigation are now being made by Mr. A. F. Gower, well known in connection with the Gower-Bell telephone. The operations being carried on are more particularly directed towards the adaptation of balloons to war purposes. On May 31, the wind being favorable, one of the automatic pilot balloons invented by Mr. Gower, with appliances for giving out its own gas and ballast, one compensating for the loss of the other, was filled with twenty-three hundred feet of gas, and ascended at about 11 o'clock. In the car a written statement was of course placed, explaining the ownership of the machine and its object, with the result that it was next heard of at Dieppe, having made a rapid passage of about seventy-two miles in a straight direction, and descended at 2.30 in the afternoon. On June 1 another pilot balloon, with a capacity of forty-three hundred feet, was started, and immediately followed by Mr. Gower in his own balloon (containing twenty-three thousand feet of gas). The object of Mr. Gower in ascending was to watch the action of the pilot; but the smaller machine made such rapid progress, that it got out of his observation, and came down in the vicinity of Paris. Meanwhile, Mr. Gower, who ascended about noon, reached the French coast at Boulogne at 2.15, and then, taking a northerly curve, travelled overland to Calais, where he made a smooth descent at 4 P.M.

— Among recent deaths we note the following: Professor Dunkes of Marburg, a well-known mineralogist and paleontologist; Samuel Cabot, ornithologist, at Boston (the type specimens of his collection are left to the Boston society of natural history); Prof. H. Weyenbergh, professor of zoölogy at the University of Cordoba, during a visit to his home in Holland; Dr. Fred. Gustave Henle, physiologist and anatomist, at Berlin, May 18, in his seventy-sixth year; Dr. Richard Böhm of Berlin, African explorer, in his thirty-second year; Dr. Carl Ohrtmann, mathematician, at Berlin, April 22; T. R. Peale, entomologist, at Philadelphia, March 13; C. Cornelius, entomologist, at Elberfeld, April 1, in his eightieth year; J. P. Jacobsen, at Thisthdt, Jutland, April 30; Prof. P. L. Panum, physiologist, at Copenhagen, May 1, in his sixty-sixth year; Paul Desains, physicist, at Paris, May 3; Dr. K. J. Andrae, professor of mineralogy and paleontology at the University of Bonn, at Bonn, May 8; Mr. William Ladd, the well-known scientific instrument-maker, in his seventy-first year; Robert von Schlagintweit, professor of geography and ethnology at the University of Giessen, in his fifty-third year.

— Dr. Herman Koch, the bacteriologist, has been created professor in the University of Berlin.

— Last year was a tolerably productive one for the collectors of prehistoric remains in Switzerland. The water of the lakes was almost constantly below the highest level, which is the most favorable state of things for explorations around the lake-dwellings. The remains discovered belong mostly to the bronze period; and the chief localities in which they were found were Lake Neuchâtel, and the settlement of Walleshofen near Zurich, the latter of which is the only station of the bronze period yet known in eastern Switzerland. Amongst the most remarkable articles discovered at this settlement in 1884 were a splendidly preserved bronze sword, several dozens of bronze hatchets, bracelets, etc. Of the remains of the stone period discovered in the same year, the most notable are those obtained at Robenhausen, including several pretty knife-handles made of yew; some excellent specimens of mechanical industry, such as thread, woven fabrics, fishing-nets, etc.; and ears of barley and wheat, one being a specimen of the rare Triticum turgidum.

— The sultan of Zanzibar claims the whole coast from Cape Delgado to the mouth of the river Juba, which is on the equator. Nevertheless, the German explorers, the brothers Denhardt, have planted the German flag at Vitu, thirty German miles south of the river Juba, and six miles inland. The explorers report the district as fertile. A German squadron, consisting of three frigates and two transports, has been sent to the coast of Zanzibar to protect this new annexation; to which, of course, the sultan objects. Three German exploring expeditions have already started from Vitu for the interior of Africa.